The four articles reviewed indicate that cohesive stretching of water is of great significance in plants. They show the magnitude of force thus available for work and give much insight into the conditions under which it is operative; also they add evidence for the cohesion theory of the rise of sap.

COPELAND[8] has devised a very simple but ingenious piece of apparatus for determining various facts concerning the movement of water through stems of lianas. From his measurements he concludes that the resistance offered by stems to water flow through them is very much less than claimed by other workers in this field; that the tension in the water column of the stem assumed by the cohesion theory does not exist; and that the living cells along the stem play no essential part in the movement of the water through it. COPELAND believes that the main problem of rise of sap remains, as he earlier stated,[9] "Why is this atmospheric pressure exhausted so slowly with the ascent of the tree that whatever height is reached, and however rapidly and forcibly water may be drawn from the wood, some pressure always remains?" Notwithstanding the ingenious character of these experiments and the suggestiveness of the results, much more work of an analytical sort is needed to establish a new theory of the rise of sap or to dispose entirely of the cohesion theory.—WILLIAM CROCKER.

Structure of the Boleti.—Very few studies on the finer structural details of the Boleti have been published. These have been fragmentary observations occasionally employed to supplement specific diagnoses drawn from the grosser features, or to interpret certain surface characters. A comparative study of the structure of all parts of the plant in a large number of species is greatly needed, and especially a study of the origin and differentiation of its parts is much to be desired. A contribution to the former phase of the subject is now presented by YATES[10] in the study of 6 Californian species, supplemented by two eastern ones.

In general, there is not such a marked differentiation of the tissues, when the size of the plants is considered, as one might expect who has not given some attention to these plants. According to the author's interpretation, the tissues of the pileus and stipe are differentiated into two main zones: an outer, the cortex ("rind"); and an inner, the trama ("context"). In some species the cortex of the pileus consists of elongate vertical hyphae, which in dry species give the pileus a tomentose appearance, as in *Boletus chrysenteron*. In the viscid species the outer layer of the walls of these hyphae is more or less gelatinized and the pileus is not tomentose, as in *B. granulatus*, *B. luteus*, and *B. cali-*

[8] COPELAND, E. B., Über das Saftsteigen. Jahrb. Wiss. Bot. **56**:447–459. 1915. PFEFFER'S Zeitschrift.

[9] COPELAND, E. B., BOT. GAZ. **34**:161–193, 260–283. 1902.

[10] YATES, H. S., The comparative histology of certain Californian Boletaceae. Univ. Calif. Publ. Bot. **6**:221–274. *pls. 21–25*. 1916.

fornicus (Murrill),[11] the last being subtomentose. In others the gelatinous matrix is firm and the pileus not viscid, or slightly so when wet, as in *B. edulis* and its variety *separans*.

Forms with a somewhat similar structure of the pileus present three zones: (1) in *B. Eastwoodiae* (Murrill),[12] form *A*, there is an outer zone of vertical interwoven brownish hairs which sometimes gelatinize to such an extent as to disappear, an intermediate zone of compactly woven hyphae, and the looser trama; (2) in *B. Eastwoodiae*, form *B*, the outer zone consists of rather distant hairs arising from a compact brown rind of interwoven hyphae; while (3) in *B. chrysenteron*, form *E*, there is a zone of densely interwoven, small brown hyphae between the palisade of hairs and the loose trama. In other species the structure of the pileus is more homogeneous, consisting of interwoven hyphae, larger and with a more open mesh in the trama, smaller and more compact and dark colored in the "rind." Such species have a glabrous pileus, as in *B. auriflammeus* and *B. Frostii*, there being 3 zones of different density.

The hymenophore (=stratum of tubes) is very uniform in the species studied. Cystidia are said to be wanting in most of those examined. In *B. granulatus* and *B. californicus* the cystidia form tufts of clavate cells which arise in the trama and project beyond the surface of the hymenium. They also occur on the dissepiment edges and on the stem.[13] In *B. luteus* the tufts of cystidia are smaller.

The general structure of the stipe is quite uniform. The hyphae in general are parallel with its axis, in some species almost strictly parallel, in others more or less interwoven. The central portion is loose and the hyphae of larger diameter; the outer portion compact and the hyphae of smaller diameter.[14] The surface of the stipe, then, is often characterized by outgrowths of short hyphae, cylindrical, clavate, or capitate cells, either in tufts, or covering the entire portion of the stem, thus forming a palisade layer. In the latter case the author speaks of this palisade as the "rind" (in *B. auriflammeus*). The "context" here then includes all the hyphae which extend more or less parallel with the axis of the stipe, that is, both "rind" and "context" of species lacking the palisade layer.

This palisade layer on the stipe in *B. auriflammeus* forms the tomentum, and in the opinion of the reviewer represents merely the vesture of the stem, not the cortex ("rind"). Cortex and medulla ("context") are of the same character as in those species with a smooth stipe, then, or where the vesture of the stipe is composed of isolated tufts of cells. This interpretation of the tomentum on the stipe of *B. auriflammeus* finds confirmation in the fact that the vesture of the stem is usually "reticulate" and represents very likely

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[11] *Rostkovites californicus* Murrill, Mycologia **7**:44. 1915.

[12] *Suillellus Eastwoodiae* Murrill, N. Am. Flora **9**:152. 1910.

[13] Absent or very rare in *B. brevipes* Pk., which MURRILL unites with *B. granulatus*.

[14] A general feature in the stipe of most agarics.

a depauperate condition of the hymenophore extending down on the stem, as in *B. edulis* described by YATES (form *B. pl. 22. fig. 10*) and by PATOUILLARD (Tab. Analyt. Fung. no. 9, 1883). Besides a few basidia, bearing spores, in this reticle on the stem, PATOUILLARD states that cystidia are also present similar to those in the normal hymenium of this species, while YATES says that cystidia are not present in the forms he examined, although one would suspect their presence from his figure. This vesture on the stem of some species may grade from a reticle above to an even tomentum below, or to tufts more or less crowded, or without a reticle tufts more or less crowded or disparate over the stem (*B. luridus*, for example). Similar examples of depauperate hymenia are abundant in the Basidiomycetes, and even occur in the Ascomycetes, in *Gloeoglossum difforme*, for example (see DURAND, Ann. Myc. 6:421. *figs. 160–162.* 1908).

Some of the different forms of *B. chrysenteron*[15] described may be interpreted as due to variations in the vesture of the stipe, the tomentum of the pileus, and the color changes resulting from the presence of oxydases, due to age, vigor of growth, relation of the dissepiment edges to the stipe surface during the origin of the hymenophore, etc., which cannot be enlarged upon here. However, the author makes no mention of the structural features of the usually sterile dissepiment edges, which in many species of agarics, at least, bear a very interesting relation to the vesture of the stipe.

The author very properly remarks that, by authority of the Third Botanical Congress (Brussels, 1910), FRIES'S *Systema Mycologicum*, 1821, is the starting-point for the nomenclature of the Hymenomycetes. But he follows MURRILL'S nomenclature[16] of the Boleti, perhaps unaware that this author does not recognize the rules adopted by the Vienna and Brussels congresses, the two largest and most representative legislative assemblies of botanists ever held. One of the deplorable results of this hunting for names by groping in the mystic and heroic age of mycology is well exemplified by the attempt to introduce the generic name *Ceriomyces* for the section containing the largest number and most typical species of the genus *Boletus*, and citing as the type of this genus *Ceriomyces crassus* Battarra.[17] It is not likely that well informed botanists will discard the name *Boletus edulis*, which is in strict conformity with the international rules,[18] and use in its stead *Ceriomyces crassus*, a con-

[15] The form *C* is very likely *B. subtomentosus*. Some students unite *B. chrysenteron* and *B. subtomentosus*. For some of the varieties of these two species, see BATAILLE, F., Les bolets, classification et determination des espèces. pp. 1–30. Besançon. 1908.

[16] N. Am. Flora **9**:133–161. 1910.

[17] BATTARRA, J. A., Fungi Agric. Arim. Hist. 62, 63. *pl. 29.* 1755.

[18] The generic name *Boletus* was properly retained by HENNINGS (ENGLER und PRANTL, Die Nat. Pflanzenfam. 1^{1**}:191. 1898) for the section containing the larger number of species, including *B. edulis*, his action being entirely in accordance with the principle of the international rules adopted at Vienna in 1905, and at Brussels in 1910 (see Article 45).

fusing medley of species, for European mycologists long since an undecipherable rebus.—GEO. F. ATKINSON.

Patrogenesis.—COLLINS and KEMPTON,[19] working on intergeneric hybridism in the tribe Maydeae, have had the great good fortune to bring to light a new case of the phenomenon discovered in *Fragaria* by MILLARDET, and termed by him "hybridation sans croisement ou fausse hybridation." The hybrid *Tripsacum dactyloides*×*Euchlaena mexicana*, carried through 3 generations, has shown no trace of characters derived from *Tripsacum*, aside from the fact that the original hybrid seed was "an unmistakable *Tripsacum* seed." Characters of *Euchlaena* appeared with the first leaves, and in further stages of development the plant was an almost normal *Euchlaena*.

In attempting to explain the complete exclusion of maternal characters from the hybrid, the authors have discussed two hypotheses: (1) that the *Euchlaena* characters have completely masked those of the *Tripsacum*, and (2) that the embryo of the original hybrid developed only from the male nucleus, which must be regarded as having dispossessed the female nucleus with which it would have been expected to unite. COLLINS and KEMPTON adopt the latter hypothesis, and look upon their hybrid as exemplifying a new type of inheritance, which they call "patrogenesis" in order to place the phenomenon in what they regard as a proper contrast with parthenogenesis. We may well doubt, in the absence of cytological data, whether this explanation is probable enough to warrant the introduction of a new term. BATESON'S terms monolepsis and amphilepsis, indicating hybrids in which the characters are brought in respectively from only one or from both parents, have already been introduced, and have the advantage that they imply nothing as to cytological conditions.

Maternal monolepsis is well known in the Orchidaceae, especially in the intergeneric hybrids between *Zygopetalum Mackayi* and species of *Odontoglossum*, *Lycaste*, and *Oncidium*. Paternal monolepsis is a rarer phenomenon, and its discovery in intergeneric grass hybrids is most interesting. That it is to be explained by merogony, however, should not be too incautiously assumed. It will be recalled that a similar explanation of DEVRIES' patroclinic hybrids in *Oenothera* was brought forward, with even some show of cytological evidence, but was afterward disproved.

In the first hybrid generation COLLINS and KEMPTON had only one plant of their *Tripsacum*×*Euchlaena*. There is no evidence, therefore, that this generation may not consist normally of more than one type, as in the case of many *Oenothera* hybrids. Certain evidence obtained by COLLINS and KEMPTON themselves almost tempts one to predict that twin hybrids will be found if it is possible to get large enough progenies.

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[19] COLLINS, G. N., and KEMPTON, J. H., Patrogenesis. Jour. Heredity 7:106–118. 1916.